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METHANOL

By Dr. Edwin E. Slosson

The public should get acquainted with methanol which they have hitherto known, if at all, by the name of "wood alcohol" or "methyl alcohol". Its new name- accent on the first syllable, please- will tend to prevent the frequent and sometimes fatal confusion of methyl with her sister ethyl, who is the more sought after and less deadly member of the family. Many a man has asked the druggist for "alcohol" for horse-liniment or cleaning his typewriter, and the druggist, not noticing the wink, has given him the kind of alcohol that makes a man drunk blind instead of blind drunk. Alcohol for industrial purposes is often denatured with methanol and when it is de-denatured for beverage purposes some of this is likely to be left in. Because of such accidents conscientious bootleggers are said to furnish free with each case of their whiskey a bundle of pencils and a card, "I am blind", so the purchaser is insured of a livelihood in case of the worst.

Methanol in its proper place, which is outside the human stomach, is a useful article in many manufactures and some eight million gallons have been made in America annually by the distillation of wood. But this method of manufacture is now hard hit by a new process which uses coal and water as the raw material. The first step in the process is the formation of the well-known "water-gas" by passing steam over hot coal. This gas is a mixture of carbon monoxide and hydrogen, both good combustibles. When the water-gas, mixed with more hydrogen, is subjected to heat and pressure in the presence of a catalyst the carbon monoxide and the hydrogen combine to form methanol.

This synthesis is similar to the Haber process which combines the nitrogen from air with hydrogen from water gas to form ammonia. By means of the Haber process Germany has been supplied with fixed nitrogen for explosives in war time and fertilizers in peace time.

The new process may prove to be equally important since by slight variations the same raw materials may be made to yield acetone, a useful solvent, formaldehyde, a familiar disinfectant, and an oily mixture, resembling petroleum, from which gasoline may be made. The demand for formaldehyde has greatly grown of late because it is one of the two ingredients of synthetic resins, such as bakelite, which give us music by means of radio receivers and phonograph records. Methanol is being increasingly employed as a solvent in lacquers and the like, and is used in making many dyes and drugs.

The inventor of the methanol process, Dr. Franz Fischer, director of the Kaiser-Wilhelm Institute at Mulheim-Ruhr, is now in this country and gave a talk at the recent Baltimore meeting of the American Chemical Society. In his process he puts the mixture of hydrogen and carbon monoxide under a pressure of 1050 pounds per square inch at a temperature of 410 degrees centigrade. The catalyst, that is, the agent that effects the combination of the gases, is zinc oxide. The Badische plant at Merseburg turns out twenty ton of methanol a day.

The Basic Badische patent on this process was granted on October 17, 1916, in the United States. When we entered the war this was taken over with the other German patents by the Alien Property Custodian and transferred to the Chemical Foundation, which grants non-exclusive licenses to American manufactures. Later developments of the process have been patented in Germany and France in 1923. The French experiments have been carried out by M. Patart with the aid of the Ministry of War, and are described in "Industrial and Engineering Chemistry" of April, 1925. It is estimated that synthetic methanol may be made by this method at about twenty cents a gallon which is less than a third of the present American price for the product of wood distillation.

GIANT NEBULAE LARGER THAN MANY SOLAR SYSTEMS

Two clouds of white hot gases each so vast as to be capable of engulfing not only the solar system but many of the nearest stars as well, have been found in two different parts of the sky, according to an announcement by Prof. Harlow Shapley, director of the Harvard College Observatory. One is in the Great Magellanic Cloud, a luminous area in the constellation of Dorado resembling a detached piece of the Milky Way. It can be only be seen from points in the southern hemisphere, but the other one is in the constellation of the Triangle which is visible in our northern skies in the early winter. It is connected with a spiral nebula, Messier 33.

Both of these objects have been known for some time although they are only visible with a large telescope and are known only by their numbers in the new general catalog of such objects. The southern one is referred to by astronomers as N. G. C. 2070 and the other as N. G. C. 604. Determinations of their actual size, however, have only been made possible by recent determinations of their distances.

Prof. Shapley himself measured the distance of the Large Magellanic Cloud by a study of photographic plates made at the Harvard branch observatory at Arequipa, Peru, and found it so far away that its light would take a hundred thousand years to reach us. The distance of the spiral, Messier 33, was determined last year by Dr. Edwin Hubble, of the Mt. Wilson Observatory, and it turned out to be about a million light years.

Using these measures of the distances, it is found that the diameter of N. G. R. 2070 is 264 light years and for N. G. R. 604 it is 198 light years, so that if the earth were placed at the center of either one, not only would the sun and planets of the solar system be included in it, but so also would a large number of the stars we see in the sky. Both objects are much greater than the more familiar gaseous nebulae, such as the one in Orion, which is only about three light years in diameter, less than the distance from us to the nearest known star.

MAGELLANIC CLOUD 84,000,000,000,000 MILES ACROSS,
LIKE STELLAR SYSTEM

The largest Magellanic Cloud, one of two vast swarms of stars seen by residents in the southern hemisphere as luminous areas in the sky, shows many characteristics which seem to place it in the same class as the spiral nebulae, proved recently to be stellar systems entirely outside the one of which our sun and all the visible stars are part. This is the opinion of Dr. Harlow Shapley, director of the Harvard College Observatory.

Dr. Shapley, who recently announced the discovery that two gaseous nebulae, one in the cloud and the other in the spiral nebula Messier 33, are each so large that a beam of light would take two centuries to pass from one side to the other in either, has continued his comparisons of the cloud and the spiral. Determination of the distance of the spiral has made possible a measurement of its diameter which turns out to be about 15,000 light years, while that of the cloud is about 14,000 light years.

Besides being about the same size, they are both of the same brightness, each, taken as a whole, being about a billion times as bright as the sun. The smaller groups of stars within each are about the same size and brightness, so that Prof. Shapley concludes that they are of similar nature. The importance of this idea, he points out, is that the Magellanic Clouds are much closer than the spirals and hence they can be studied to gain information concerning the distant spirals.

EARTHQUAKES PREDICTED FOR UNITED STATES

Specialists who keep their fingers on the earth's pulse say that earthquakes can now be predicted with more or less certainty.

The forecasts are general in character. The strength of a quake and the precise time and place of its occurrence cannot be determined with present day knowledge. But by studying the earth's changes and noting the facts about earthquakes of the past, the quakes of the future are charted.

Thus, it is safe to predict that there will be an earthquake in California next week because California has had a recorded quake during each week in past years, according to Major William Bowie, of the U. S. Coast and Geodetic Survey.

Maj. Bowie also finds that a heavy destructive earthquake is likely to occur along the Atlantic coast within the next century because there was a heavy shock in New England in the early part of the nineteenth century and another in South Carolina in 1886. An earthquake of some sort within the next year can be predicted with reasonable certainty for the Atlantic coast because shocks occur every year in this region, though most of them are noticed only by the sensitive seismograph.

A heavy quake for the Mississippi Valley is predicted by Maj. Bowie to take place sometime in the coming century. The valley had a seriously destructive shock in 1811.

The earth's crust, 60 miles thick, is constantly subjected to tremendous pressure, he explains in a communication to "Science". Gravitation forces soil, rocks, and water into new positions. Some portions of the crust are forced down into hotter regions while other portions are rushed up into colder regions, owing to changes in equilibrium due to the erosion of the mountains and the deposition of the debris on the coast. The expansion and shrinking which result from changes in temperature cause chemical and physical changes. Sometimes the folding and yielding of the rocks takes places suddenly, and there is an earthquake.

"The earthquake is merely a symptom of something more fundamental taking place in the earth's crust," he adds. "The earthquake is the effect rather than the cause, just as we may say that for a human being the chill is a symptom of malaria rather than the disease itself."

U. S. POPULATION ADVANCES MORE SLOWLY

Although the population of the United States is now at the high water mark of 114,311,000 people, the advance over last year was less than the average for the last five years, according to the estimates of the National Bureau of Economic Research, and the opinion is that the once rapid advance has now definitely slowed up.

That the regular increase in the population has not been due to immigration but to the excess of births over deaths is shown by figures covering the last sixteen years. In that period there were over 41 million births and about 22 million deaths, or an excess of 19 millions births. About 5½ million were added by immigration bringing the total increase to about 24 million. Of this number, immigrants formed little more than a fifth.

Both the birth and the death rates in the United States are falling, but the death rate is falling faster. Ten years ago the birth rate was 26.2 for each thousand persons while today it is 23.3, a decrease of 11 per cent. At the same time the death rate has decreased from 13.4 per thousand to 11.7, a decrease of about 13 per cent.

In 1924, 2,645,000 babies were born and 1,333,000 persons died, or one death was compensated by two births. If the number of births and deaths remains stationary in 1925, as is very likely, ten babies will be born every two minutes and 5 persons will die in the same time.

Further studies by the Bureau showed that employment has again shrunk to the pre-war level, and that there are now 38 persons out of every 100 who earn a salary or wages. But children, women, and others not working for money are almost as numerous as this class. Employers and men and women in business for themselves make only up only 8½ per cent of the population, and the actual number is now less than it was in 1915. It is held that the growth of large corporations has kept down the number of independent business men.

A duralumin metal flying boat capable of making 2,500 miles in non-stop flight is being built for the U. S. Navy.

MOONLIGHT SPEEDS GROWTH OF BACTERIA

Growth and activity of bacteria can be speeded up by the kind of light supplied by the moon, T. F. Morrison, graduate student at Princeton University, has discovered through experiments on the kind of microorganisms that cause dead fish to shine in the dark. This work follows up and appears to confirm results obtained a couple of years ago by E. G. Bryant, in South Africa, who found that fish exposed to the moonlight spoiled more quickly than those kept in the dark.

In his experiments Mr. Morrison used an artificial moonlight, made by passing ordinary electric light through a polarizing prism. The waves in polarized light vibrate in one direction only, instead of haphazardly at all angles as in ordinary light. Moonlight is known to consist very largely of polarized light; Mr. Morrison used "artificial moonlight" partly to avoid having to sit up all night, and partly because the artificial light could be subjected to laboratory control.

He divided a culture of luminescent bacteria in three parts, one of which he placed under polarized light, or "artificial moonlight", one under ordinary light, and the third in darkness. In fifteen out of eighteen experiments he got results much more quickly under the polarized light.

Mr. Morrison does not yet offer to explain why polarized light should cause greater growth and activity than ordinary light or no light at all. His experiments, however, were inspired by the work of an English botanist, Miss E. S. Semmens, who found that the digestion of starch in plants is stimulated by either moonlight or artificial polarized light, and who has demonstrated that seeds germinate more rapidly under its influence. Mr. Morrison states that while there is no starch in bacteria, there are other chemical substances present that are related to starch, and that his results may be considered as parallel to those of Miss Semmens.

FIVE-LENS CAMERA TO AID AIR MAPPING

A new type of airplane camera for mapping purposes, having five separate lenses and taking as many pictures in different directions at once, is now being constructed for the U.S. Army Air Service. According to Major J. W. Bagley, of the Corps of Engineers, it is expected that its use will facilitate the interpretation of aerial photographs and increase the accuracy with which they may be used as maps.

Previously three-lens cameras have been used which can photograph the region directly beneath the plane and at each side, but a four-lens camera has been developed which photographs in addition the territory behind the aviator. This aids in orienting the photographs with respect to each other when they are combined to form the map, and has proven a great time saver, said Major Bagley. The fifth lens, in the new camera, will cover the region ahead and is expected to be a further improvement.

Major Bagley also told of the use in the air service of a new and faster film.

"The improvement so made can best be stated in terms of increased time during the day that aerial photographs can be satisfactorily obtained," he said. "Formerly it was necessary to have a bright sun 20 to 25 degrees above the horizon.

With the new film it is possible to get satisfactory photographs when the sun is only 10 degrees high. Before it was only during the middle of the day that fully exposed photographs could be taken, but it is now possible to start early in the morning during midsummer and to work until five o'clock in the afternoon. The photographic day has thus been nearly doubled.

EXCAVATIONS IN MONGOLIA REVEAL ANCIENT TREASURES

The distinguished Russian archeologist and explorer, P. K. Kozlov, head of the Russian Geographical Society's expedition to Tibet, has recently returned to Leningrad with an extensive collection of treasures of an ancient civilization. Many of these relics date from the second century, B. C., and bear traces of Indian, Byzantine and Greek influence.

The chief excavations were carried out in the mountain chain of Noin-Ulla, south-west of Kentei, in Mongolia. Here the expedition discovered burial mounds, most of them nearly level with the ground; a few were two to three meters high in rectangular form with funnel-like central depressions. Excavations revealed rectangular burial chambers, about five meters long and four meters wide, each chamber containing a smaller chamber with a wooden coffin. The wall, ceilings and floors of both the inner and outer chambers were constructed of logs, squared, planed, and joined.

Among the relics discovered in the burial chambers were bronze ornaments, vases, glasses, wooden articles, and primitive fire-making apparatus, consisting of small boards pierced with holes in which heat was generated by rapidly rotating sticks. Silken fabrics were found of great artistic and scientific interest, resembling fine gauze, with beautifully woven designs. Some of these fabrics, at present on exhibition in Leningrad, having been cleansed and treated, appear almost new. Rich ceramics were discovered bearing inscriptions which revealed the epoch to which they belonged - the Han dynasty, dating at least 200 years B.C. The gem of the discoveries is considered to be a tapestry, representing an elk attacked by a winged griffin, and showing Greek influence.

Gold ornaments indicated Indian, Persian, and possibly Greek influence. They include a ring, bearing the head of a mythological animal with a stone set in the forehead, and a horse resembling those depicted on Scythian vases.

The excellent preservation of these relics is attributed to the fact that the tumuli were from thirty-five to fifty feet deep, at which depth the temperature was practically constant at the freezing point, and had not changed for centuries.

The expedition also brought back important botanical and zoological collections which have been distributed among the appropriate museums.

Study of these relics reveals that two thousand years ago there flourished in the plains of Mongolia a people whose art bears traces of their contact with Hellenic culture. The excavations were carried on in the Sudzuk valley, about 120 versts from Urga, and only fifteen miles from the great caravan route.

BLAMES NERVOUS DISEASE FOR SPRING FEVER

A new theory concerning "spring fever", spring tiredness or, in Finnish, "vartotthet", has been developed by the Finnish scientist E. Ehrstrom. After an investigation of 3,039 cases Ehrstrom has come to the conclusion that spring tiredness must be classified as a real and serious nervous disease.

With the data of thousands of cases at his hand, Ehrstrom classified the patients according to the time of the year the difficulties developed. He found that they occurred mainly in the spring of the year when the birds were singing and the buds were beginning to appear. And the worst period was June, the happy month of brides. In the autumn the number dwindled, and in winter there were hardly any at all.

In order to carry his investigations a step further Ehrstrom tried for a correlation of his results with the chronological table showing within what months the 5,471 suicides occurred in Finland in the period between 1851-1907. Again he found that they occurred in the spring, particularly in June. Dr. Ehrstrom would revise an old folk adage so that now, in the spring, a young man's fancy lightly turns not only to love, but also to madness, and even to suicide.

SENSE OF TASTE LOW IN BIRDS

Birds have a sense of taste very similar to that of human beings, but not so acute, according to the recent investigations of a German ornithologist, Bernhard Ransch. He tested canaries for their sensitiveness for sour, salty, bitter and sweet substances by giving them solutions of acetic acid, common salt, powdered aloes, and cane sugar in their drinking water. The lowest limit for acetic acid, a $1\frac{1}{2}$ per cent solution which appears to us only slightly sour was refused by the birds after one or two trials. Common salt was refused in a 5 per cent. but accepted in a 2 per cent. solution, which still appears to us distinctly salty.

The birds were less sensitive to the bitter test; while refusing a strong solution they readily took a weaker one, the bitterness of which would seem unbearable to us. This lack of sensitiveness for pronouncedly bitter substances may be explained by the fact that seed-eating birds are accustomed to many kinds of bitter seeds. The sweet taste of a 20 per cent. solution of cane sugar apparently produced a positive sense of pleasure.

These experiments seem to show that birds have a well developed sense for all four taste qualities, but with the exception of their taste for bitter substances the limit sensation is relatively low.

WILD ANIMALS PICKED BY TEMPERAMENT FOR CIRCUS CAREERS

All kinds of wild animals can be trained, but not all individual lions and tigers are potential circus stars, John T. Benson, of Hagenbeck Brothers Company, told a group of mammalogists meeting in Washington.

"Training animals is an art," said Mr. Benson, "Performers must be carefully selected for their particular tricks. Unless an animal has the right disposition for a given line of work, a trainer cannot hope to succeed.

"Cruelty in training is unnecessary and undesirable from any point of view," he continued. "The cracking of the whip in the arena is a signal to direct the performing animals, not to cow them. The expert trainer has spent days teaching his charges not to be afraid of the sound of the whip.

"There are instances of shows in which tricks that proved popular have been reproduced with other animals which did not happen to be suited to those tricks. This is where cruelty comes in. An animal that slinks on the stage, or into the arena, with a cowed look and its tail between its legs has been cruelly treated, and audiences should show disapproval of such displays.

"Some beasts are treacherous, but the animal with the bad eye and skulking manner is not selected for training by any expert."

Perfect specimens of wild beasts are becoming scarce, according to Mr. Benson. Perfect lions and Indian elephants are rare in zoological gardens and circus collections.

"Siberian tigers are almost unknown in this country," he said, "and I don't think that there is a male eland in America. It is only a few years before perfect specimens of wild life will be known to us only by museum relics and by pictures."

----- CHILD MARRIAGE A PROBLEM FOR STATES

Need of further study of child marriages is urged by the Russell Sage Foundation, which has just made an investigation of the child marriage question in the United States. The Foundation points out that its work is only a beginning, and that each state should study local conditions and should obtain accurate and up-to-date information as to what is really going on in its locality.

The Foundation's report tells a story of child brides and child widows; of boys of high school age taking on themselves the responsibilities of a wife and a home; of licenses fraudulently sworn to or illegally issued; of hasty elopements followed by annulments, divorces, and other unfortunate court proceedings. The estimate is made that approximately 343,000 women and girls living in the United States began their married lives as child brides - under 16 years - within the last 36 years. To this figure must be added 324,000 husbands who were married at 17 years or younger.

The halo of romance which is popularly supposed to surround boy and girl marriages is rarely seen in real life, the social workers find. Some of the youthful brides and grooms take marriage vows in order to escape unhappy home conditions. Others are the victims of exploitation and fraud. Some are anxious to escape going to school or working in factories. Many of the weddings are hastily arranged, and still more are soon repented.

In nearly half of 240 cases especially studied the parents knew of the proposed marriages and gave their consent to the weddings. Four of these children were married at eleven years with parental consent.

Among the protective measures which the Foundation believes that each state should have are: a law requiring advance notice of intention to marry, employment of responsible men ~~and~~ women to issue licenses, better proofs of age given by the licensees, and a reasonable minimum age.

"If the present minimum age is absurdly low, as in some states it is," says the report, "then advance it gradually and at the same time see that the law is enforceable and enforced. A minimum of 14 is better than one of 12; a minimum of 16 is better than either; but it may be impracticable to jump from 12 to 16. The evidence, we feel, points to 18 as the minimum towards which our cultural standards are likely to be advanced in time, but few states are ready for this as yet."

FRENCH LABORATORIES WOULD PROFIT BY TAX

Commerce and industry will be required to contribute to the financial support of scientific research in France, if a measure passed by the Chamber of Deputies is also approved by the Senate.

The bill provides for a tax of five centimes on each 100 francs paid in salaries by industrial and commercial concerns. The sum which the tax would raise for French scientific laboratories is estimated at 14,000,000 francs a year. This is about \$700,000 according to the present rate of exchange.

MODERN METHODS DEVELOPING FORESTRY IN PHILIPPINES

The costly experience of forest destruction in the United States proper is being turned to advantage in the development of the tropical hardwood forests of the Philippines, Maj. George P. Ahern, trustee of the Tropical Plant Research Foundation, states.

Lumber companies operating over large tracts are not being given a free hand with the forests, Major Ahern said, but are granted twenty-year cutting concessions, for which they pay stumpage running from \$10 to \$20 per acre cut over, and which are renewable if properly handled. The areas granted are large enough so that a given company will require eighty or ninety years to make the first cutting, which gives plenty of time for second growth timber to develop. Complete clearing is not permitted, except where it can be shown that the land is of greater value for farms than for forests. Elsewhere, as a rule, all trees less than sixteen inches in diameter must be left standing.

"When we first started operations," Major Ahern said, "firms with experience in tropical forestry told us that modern logging machinery could not be used. We used it. We put in light railways to bring the timber out, and did away with animal transport and with much of the manual labor. They told us, too, that only the few valuable woods would pay for the cutting. We are taking many other kinds of wood, which are now in high demand for veneer. They told us that a forest so mixed as ours, which comprises at least twenty-five hundred tree species, could not be handled profitably. We studied the possible uses of some twenty odd dominant species constituting about 80 per cent. of the stand, and made tables for the information of engineers and constructors, and now have a good market for everything we take out."

"Philippine mahogany, of course, is one of our best payers. The mahogany cut in Central America averages less than 2000 feet per acre; Philippine mahogany and a few other woods in some instances run in some areas as high as 40,000 feet per acre. And the Philippine mahogany and the valuable veneer woods are replacing themselves where they have been cut.

"Where the cut-over lands are suitable, Filipinos are coming in and farming them for sugar cane and other crops. At first our concessionaires resented their presence as 'squatters', but I pointed out to them that they never held the land more than two or three years, after which the jungle took it back again, and the farmers had to move on to fresh fields. Moreover, the presence of these settlers means a supply of labor, and helps to build up settled communities in the forest country.

"Fortunately, we have no fire problem, other than that incidental to the shifting agriculture above mentioned. The 'slash', which in the United States would constitute a serious menace, may simply be left on the ground in the Islands, to rot and become part of the soil. The climate is so moist that forest fires have no terrors."

WOMEN ABSENT FROM WORK MORE THAN MEN

That women employees lose over twice as much time as men employees is shown by a research conducted by Harry W. Hepner, of Syracuse University, to be reported in the next issue of the Journal of Personnel Research. A large industrial concern in considering the equalization of salaries for their men and women office employees made an investigation of the relative amount of absence of men and women. It was found that over a period of three months the female employees lost over six per cent. of their working time by absence while only slightly over two per cent. was lost by the male employees. Both sexes worked under exactly the same office conditions. As a result of the study this particular company decided that their salaried women employees did not deserve the same pay as men even when they hold the same kind of positions.

One interesting side light developed by the investigation was the fact that absence for both men and women was less on pay days than on other days. In one case 50 employees were absent on the day before pay day and only 6 on pay day.

U. S. AGRICULTURE HELPS LATIN-AMERICAN FARMER

What Uncle Sam learns of farms and crops at experiment stations and in research laboratories is not only communicated to the farmers in the United States but is broadcast to Latin America in a series of pamphlets in Spanish prepared under the direction of Wilson Popenoe of the Department of Agriculture in cooperation with the Pan-American Union. Three publications have appeared so far.

The United States consumes 50 per cent. more diamonds and precious stones than all the rest of the world.
